Background Description of South Carolina's Natural Gas System

1) Introduction

The State of South Carolina's ("State") natural gas system is the infrastructure that provides for the safe and reliable delivery of natural gas to the State's residential, commercial, industrial, electric generation, and other various gas end-users. South Carolina's natural gas infrastructure consists of three interstate pipelines, two investor-owned utilities ("IOU"), and 14 natural gas municipal utilities.

Interstate natural gas pipelines are generally large systems that cross multiple states and are regulated by the Federal Energy Regulatory Commission ("FERC"). These pipelines provide the transportation of natural gas from production zones to take-away and market demand centers. Since the State has no in-state natural gas production or processing facilities, the interstate pipelines are essential to provide the transportation required to move gas from various supply regions to the State's IOU's and municipal gas utilities.

Interstate pipelines, IOU's, and municipal gas utilities are all responsible for the safe and reliable delivery of natural gas to support the needs of end-users. Each IOU and municipal gas utility has a respective service area. IOU's are subject to the oversight and regulation of the South Carolina Public Service Commission ("SCPSC") whereas the municipal gas utilities are not. Outlined below is a summary list of the interstate pipelines, IOU's, and municipal utilities in the State:

Investor-Owned	Municipal Utilities
Utilities - PIEDMONT NATURAL GAS CO INC - SOUTH CAROLINA ELECTRIC & GAS CO **Interstate Pipelines** -DOMINION CAROLINA GAS TRANSMISSION -SOUTHERN NATURAL GAS CO -TRANSCONTINENTAL GAS PIPE LINE CO	-BAMBERG BOARD OF PUBLIC WORKS -BENNETTSVILLE ELECTRIC & GAS, CITY OF -CHESTER COUNTY NATURAL GAS AUTHORITY -CLINTON - NEWBERRY NATURAL GAS AUTHORITY -FORT HILL NATURAL GAS AUTHORITY -FOUNTAIN INN NATURAL GAS SYSTEM -GREENWOOD COMMISSION OF PUBLIC WORKS -GREER COMMISSION OF PUBLIC WORKS -LANCASTER COUNTY NATURAL GAS AUTHORITY -LAURENS COMMISSION OF PUBLIC WORKS -ORANGEBURG PUBLIC UTILITIES -UNION UTILITY DEPT, CITY OF -WINNSBORO MUNICIPAL GAS SYSTEM, TOWN OF -YORK COUNTY NATURAL GAS AUTHORITY

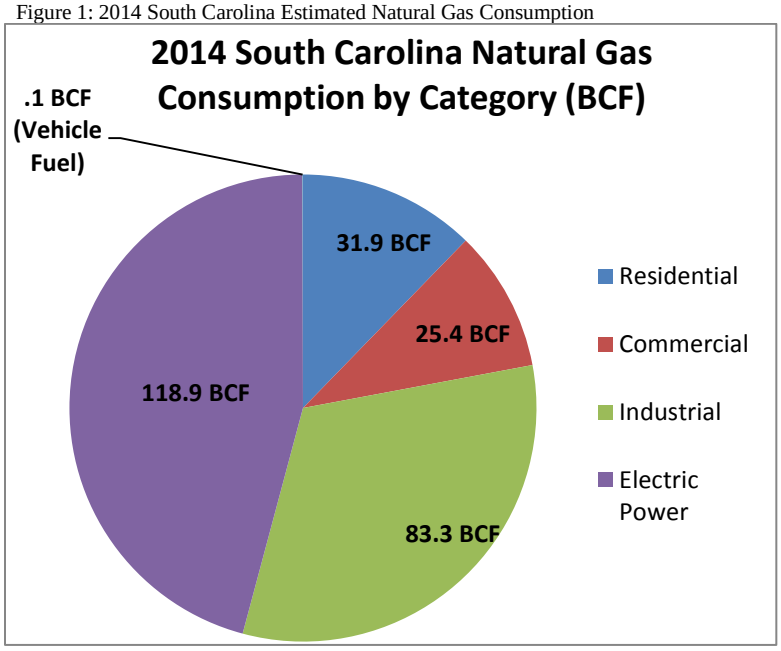
2) Consumption and Supply

According to the American Gas Association's ("AGA") state profile, the State of South Carolina had approximately 650,735 natural gas customers. This number is comprised of 593,286 residential, 55,997 commercials, and 1,452 industrial customers. In 2014, State customers consumed approximately 259.6 BCF of natural gas, according to the Energy Information Agency ("EIA"). The usage by category is summarized in Figure 1.

Historically, the majority of natural gas consumed by end users in the State has originated from the Gulf Coast production region. Interstate pipelines have transported this natural gas from various supply access points and production regions to interconnection points into the State.

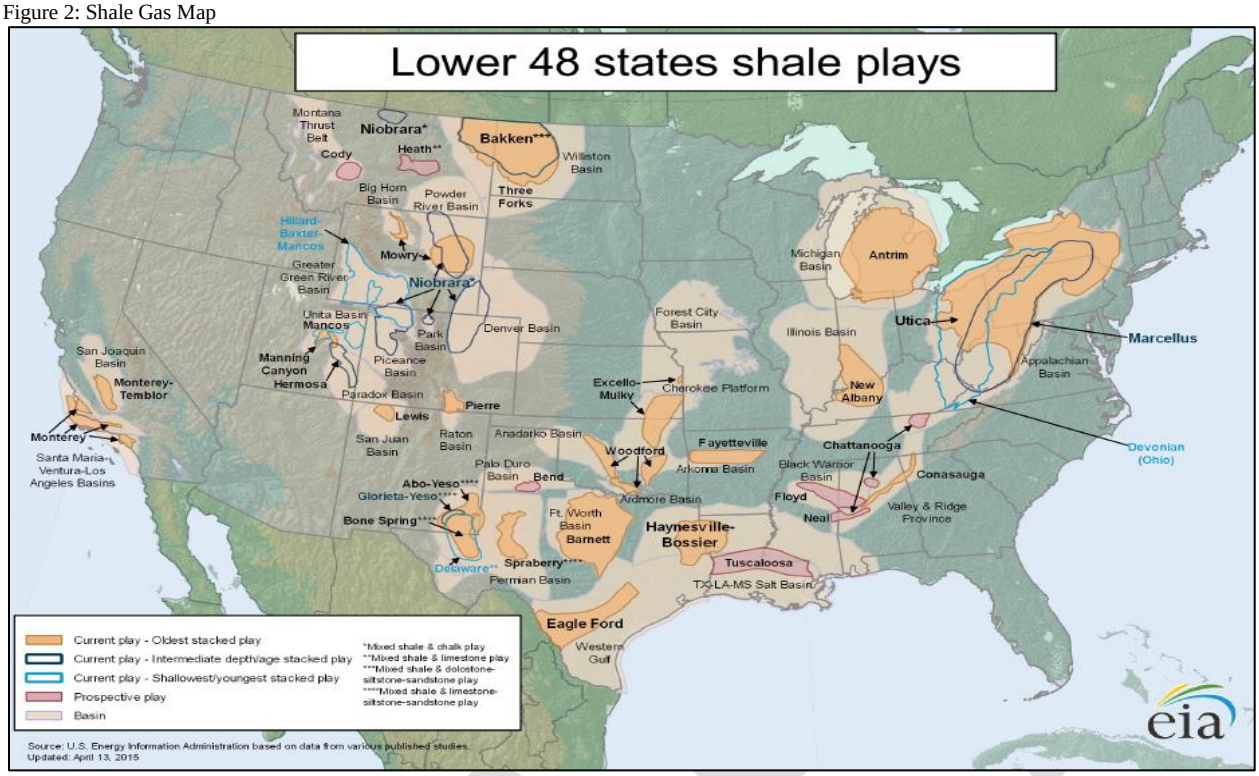
Figure 2 summarizes the major shale basins in the United States.

Figure 1: 2014 South Carolina Estimated Natural Gas Consumption



(Source: EIA-176 data)

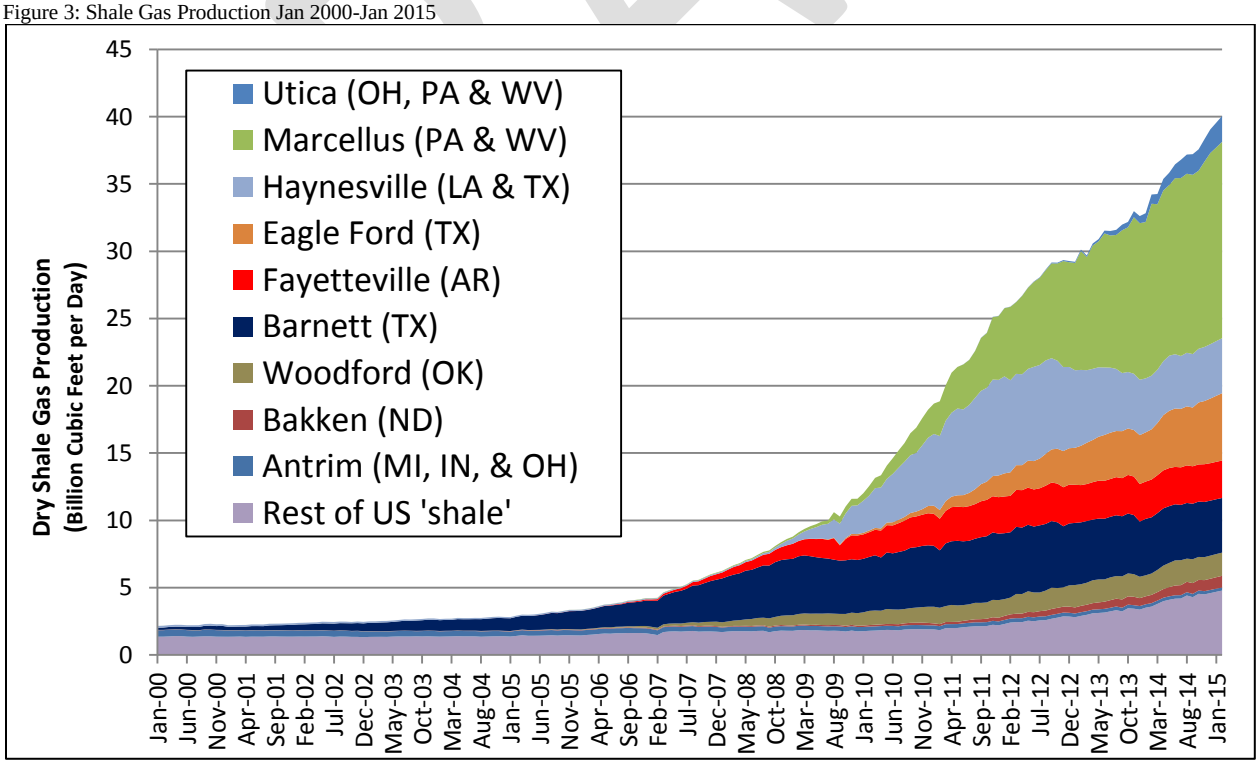
Figure 2: Shale Gas Map



(Source: EIA)

The major shale production regions in the Gulf Coast are the Barnett, Eagle Ford, Fayetteville, Haynesville, and Woodford. As outlined in Figure 3, the initial shale growth occurred in the Barnett, Fayetteville and Hayneville shale plays. In recent years, the net growth is shale production has been led by the Marcellus and the Utica shale plays of Ohio, Pennsylvania, and West Virginia. This production in the Northeast is what could ultimately change the State's supply source.

Figure 3: Shale Gas Production Jan 2000-Jan 2015

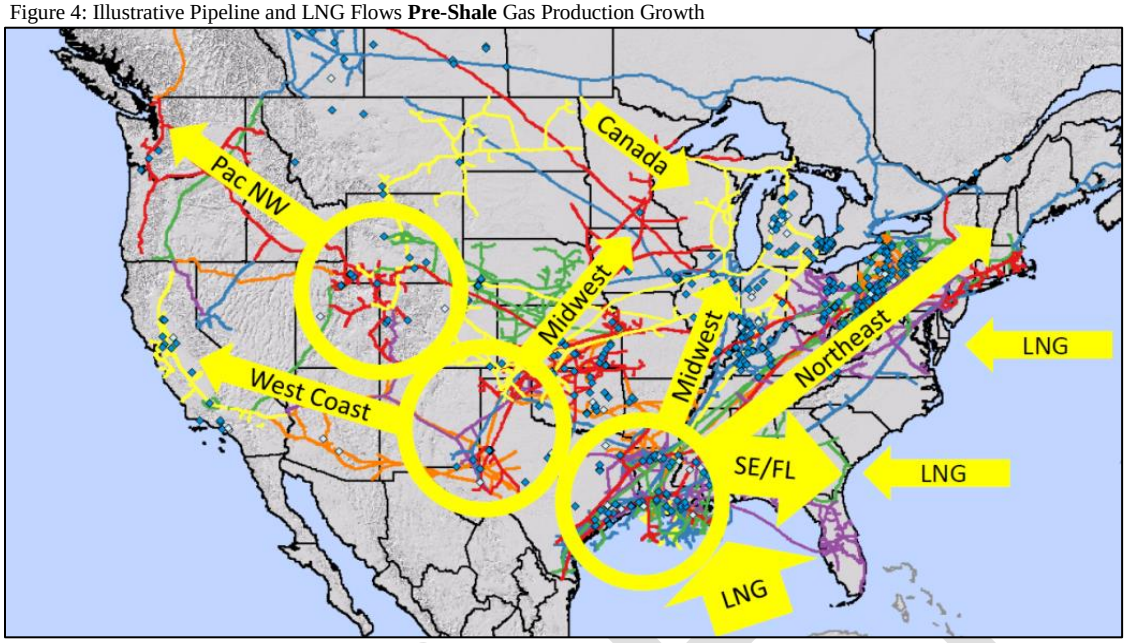


(Source: EIA)

With the shale gas growth that has occurred over the last several years, natural gas supply sources and traditional pipeline flows across the nation are in the process of changing. Shale gas growth has provided a significant new source of supply and is changing the

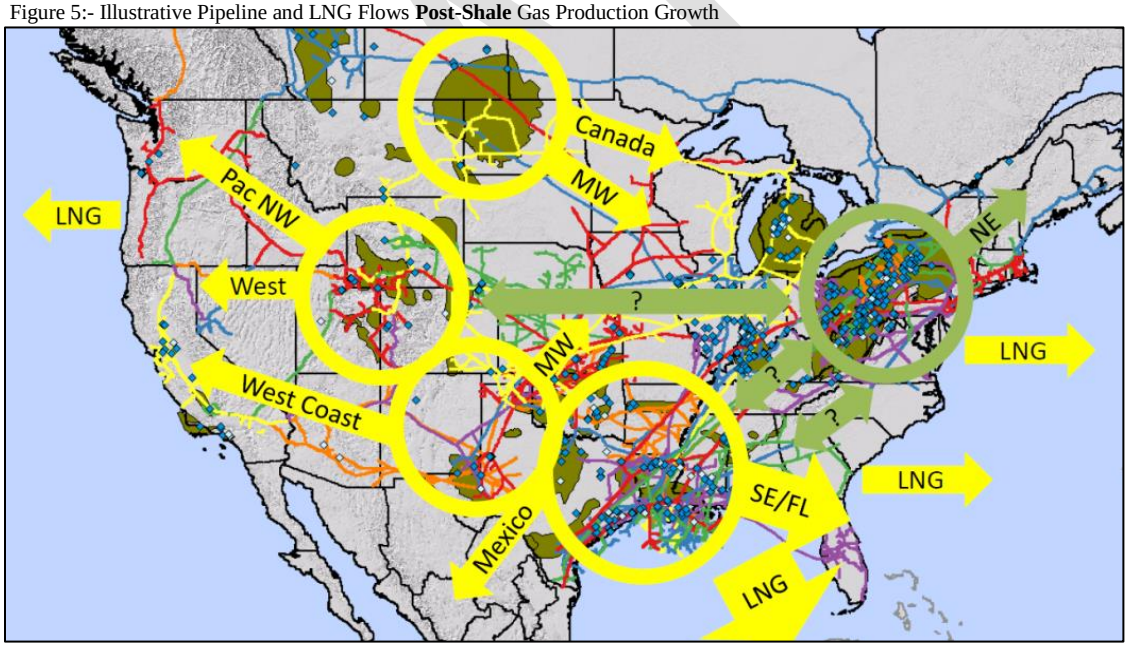
supply dynamics of the Eastern United States. With the growth in Marcellus supply, traditional gas supply pipeline flows from the south to the north are being displaced with gas produced in the Northeast. New pipeline projects are being proposed and executed to move the growing Northeast gas supply to markets to the west, south and north. This is illustrated in the figures 4 and 5 below.

Figure 4: Illustrative Pipeline and LNG Flows **Pre-Shale** Gas Production Growth



(Source: America Natural Gas Alliance)

Figure 5:- Illustrative Pipeline and LNG Flows **Post-Shale** Gas Production Growth



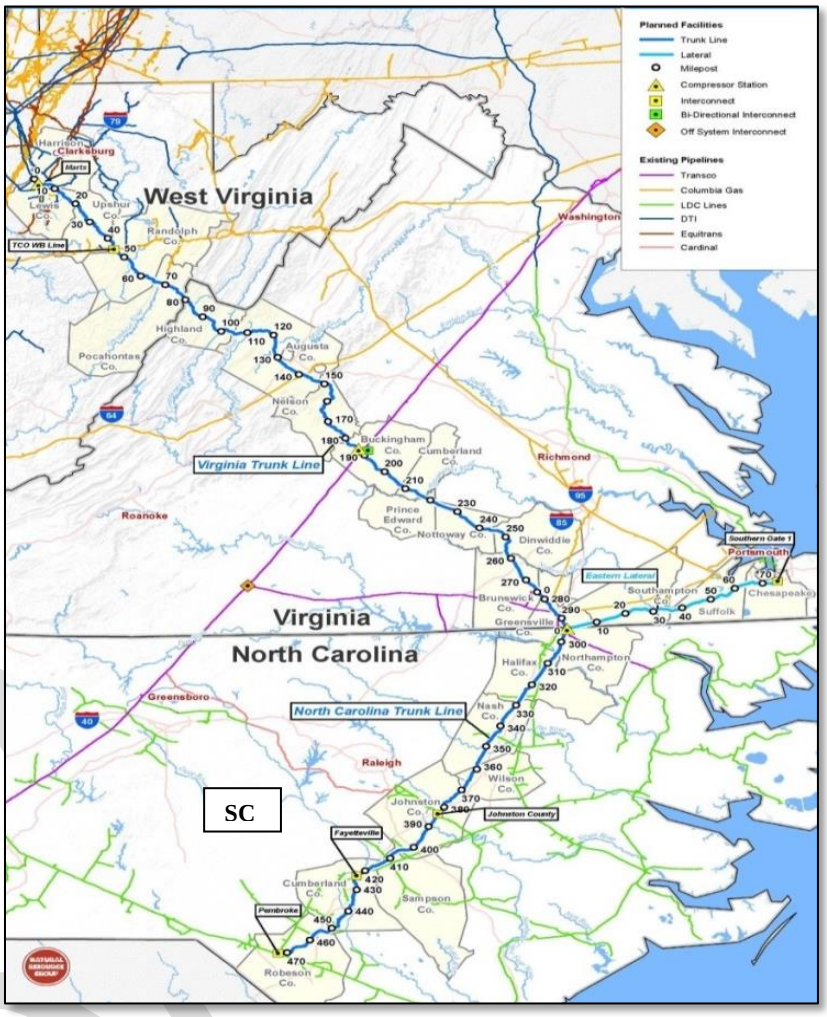
(Source: America Natural Gas Alliance)

Given the growth in domestic shale gas production and resulting reduction in natural gas prices, additional demands is resulting including petrochemical, pipeline exports to Mexico, and LNG ("Liquefied Natural Gas") exports of US supply. There are currently multiple projects underway to build-out current US LNG export capability, especially in the Gulf Coast. There are currently 5 projects that are currently under construction across the US that will provide approximately 8.9 BCF/day of LNG export capability by 2020. For example, the first of such LNG exports left a Cheniere Energy facility in Louisiana bound for Brazil in February of 2016.

As outlined above, the growth in shale supply is providing new sources of gas supply for end users and is shifting traditional south to north pipeline flows. An example of new pipeline infrastructure that is transporting growing Northeast shale gas production from the Marcellus and Utica to the south is the proposed Atlantic Coast Pipeline ("ACP"). ACP is an approximately 540 mile FERC regulated pipeline originating in Harrison County, West Virginia. The southern termination of ACP is in Robeson County, North Carolina, which borders the State of South Carolina.

ACP will initially have a capacity of 1.5 Bcf/d, with future expansion capability up to 2.0 Bcf/d. The project will offer additional supply capacity for economic growth, direct supply access to shale production, and pipeline diversity to meet the growing needs of power generators and gas utilities. The project is summarized in Figure 6.

Figure 6: Atlantic Coast Pipeline Map

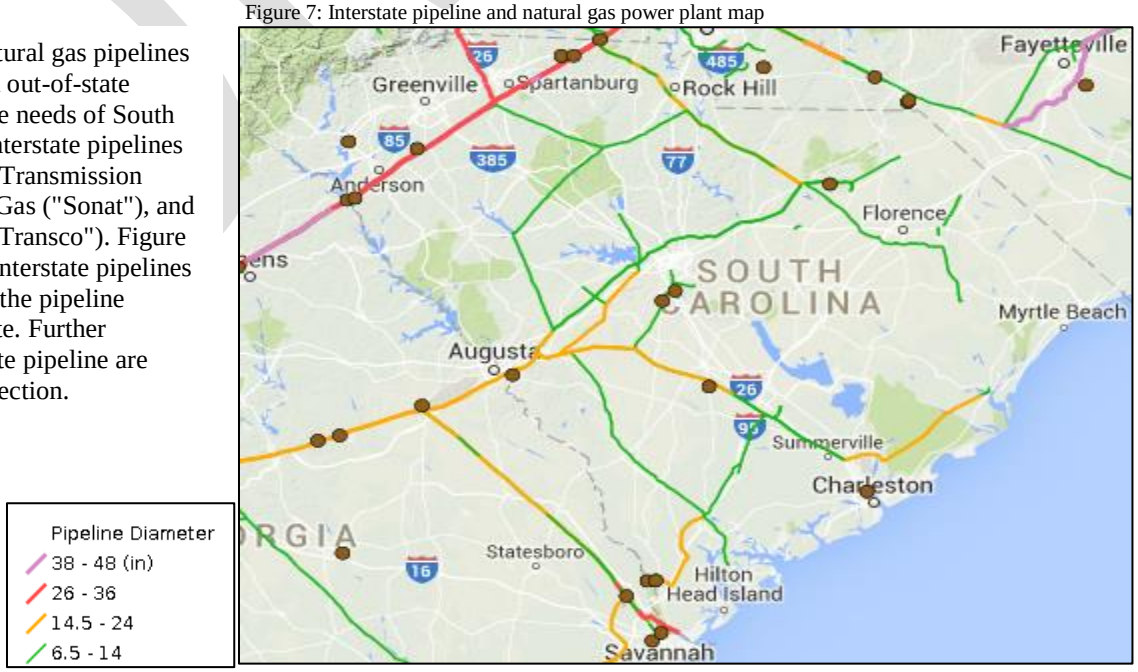


(Source: Dominion)

3) Interstate Pipelines

There are three interstate natural gas pipelines that deliver natural gas from out-of-state supply sources to support the needs of South Carolina end-users. These interstate pipelines are Dominion Carolina Gas Transmission ("CGT"), Southern Natural Gas ("Sonat"), and Transcontinental Pipeline ("Transco"). Figure 7 shows the location of the interstate pipelines and the approximate size of the pipeline infrastructure across the State. Further descriptions of each interstate pipeline are summarized further in this section.

Figure 7: Interstate pipeline and natural gas power plant map



(Source: Platts & MHFI - used with permission)

Dominion Carolina Gas Transmission (CGT)

CGT is the interstate pipeline with the widest geographic coverage in South Carolina. It was formed in 2006 with the merger of two SCANA Corporation subsidiaries which are SCG Pipeline and SC Pipeline Corporation. On February 1, 2015, Dominion Resources acquired CGT from SCANA. Dominion Resources later reorganized CGT as part of the Dominion Midstream Partners subsidiary.

The CGT system is comprised of pipelines between 2" to 24" inch diameter pipeline with operating at pressures up to 1200psi. CGT's system and interconnects with Sonat and Transco are shown in Figure 8. The majority of the natural gas that flows into CGT is sourced from Sonat and Transco, as shown in Figure 9. CGT's system is responsible for delivering gas to the majority of natural gas utilities in the State that do not have direct access to Sonat and Transco.

Figure 8: CGT map with interstate pipeline interconnects (Source: Dominion)

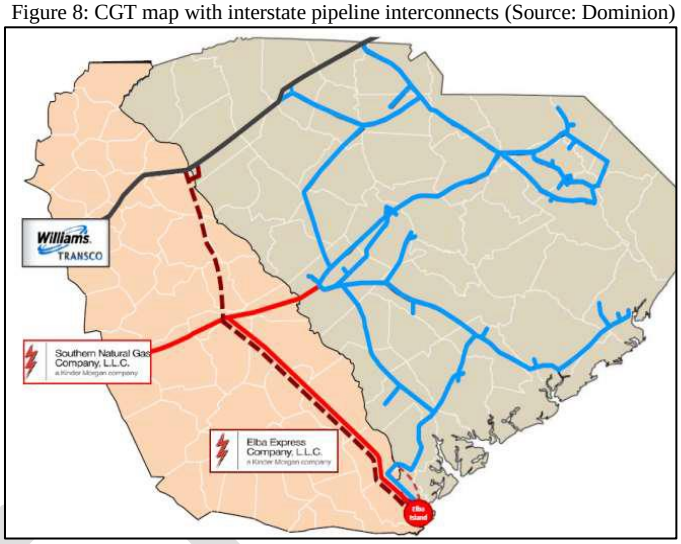
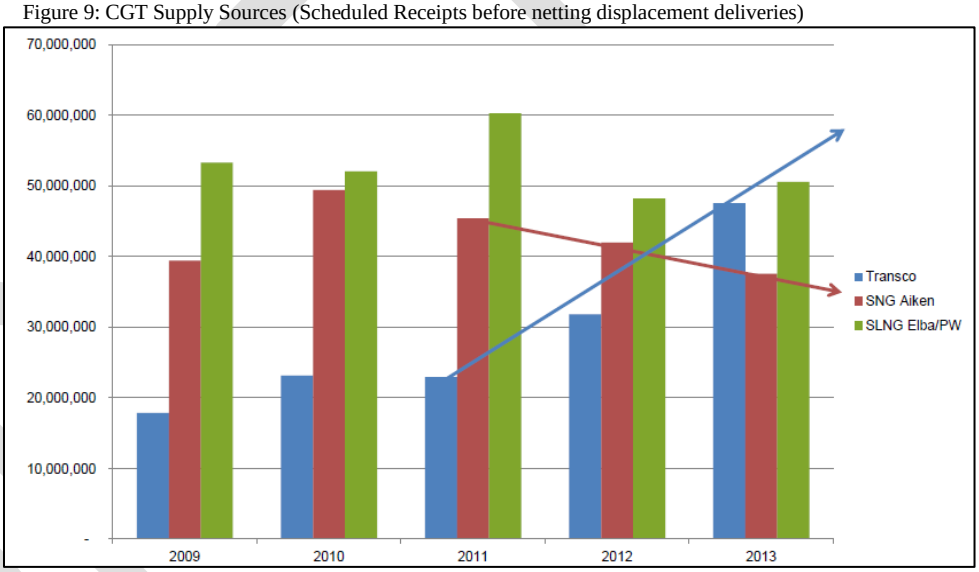


Figure 9: CGT Supply Sources (Scheduled Receipts before netting displacement deliveries)



(Source: SCANA)

CGT's estimated throughput in 2014 was approximately137.5 BCF, as shown in Figure 11. Overall throughput grew approximately 9.7% between 2010 and 2014. CGT provides natural gas delivery service to the industrial, LDC ("Local Distribution Company"), and power generation sectors.

Natural gas displacement has grown as natural gas flows change across the Eastern United States. Additionally, a decrease in LNG imports at Elba Island, Georgia increase displacement throughput.

Figure 10 outlines CGT's proposed $119 million expansion, which was filed with the FERC in March of 2016. The project includes 55 miles of 12" pipe in Spartanburg, Laurens, Newberry and Greenwood counties. There is also a separate 5 mile section of 4" pipe entirely within Dillon County. SCE&G will be the anchor shipper, while Flakeboard Co. and Wyman-Gordon have signed precedent agreements for the remaining capacity. The project will increase deliveries by 80,000 Dth/d.

Figure 10: CGT Map with proposed expansion

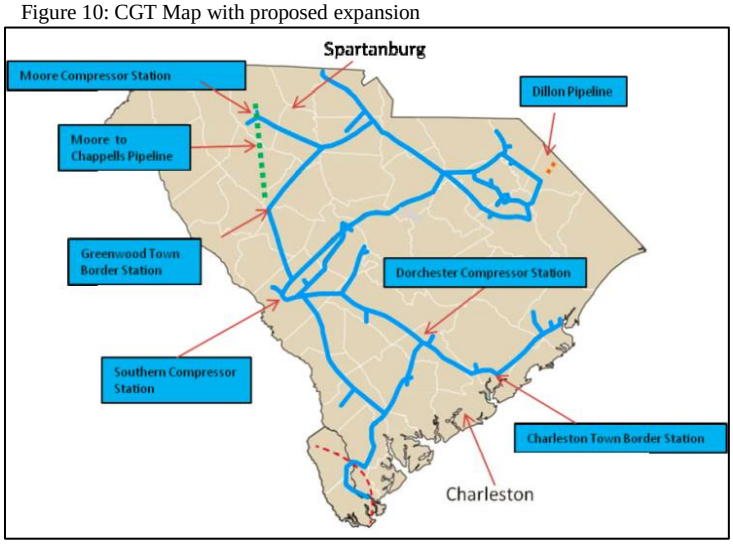


Figure 11 - CGT Throughput by Sector (rounded to BCF)

Sector	2010	2011	2012	2013	2014
Industrial	22.3	23.8	26.8	27.0	28.0
LDC	64.9	59.1	54.0	58.9	59.5
Power Generation	37.5	45.5	38.9	42.3	38.2
Displacement	.6	.5	2.1	7.3	11.8
Total Throughput	**125.3**	**128.9**	**121.8**	**135.5**	**137.5**

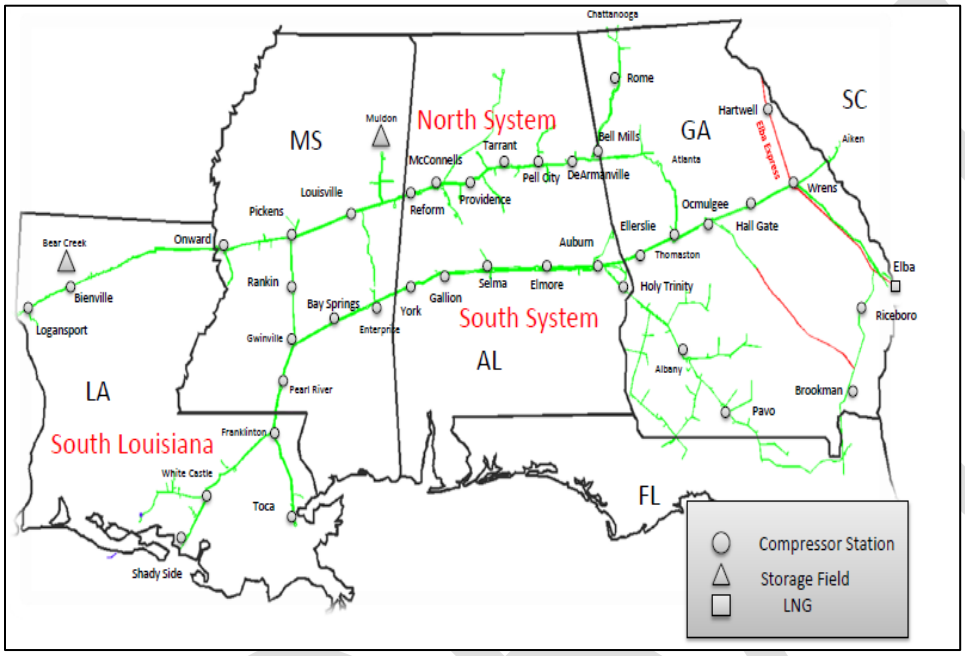
(Source: Dominion) (Source: Dominion)

Southern Natural Gas (Sonat)

Sonat is owned and operated by Kinder Morgan. Sonat primarily transports natural gas from the Gulf Coast to other states in the Southeast, including South Carolina. As shown in Figure 12, Sonat connects into South Carolina in both Aiken and Jasper counties.

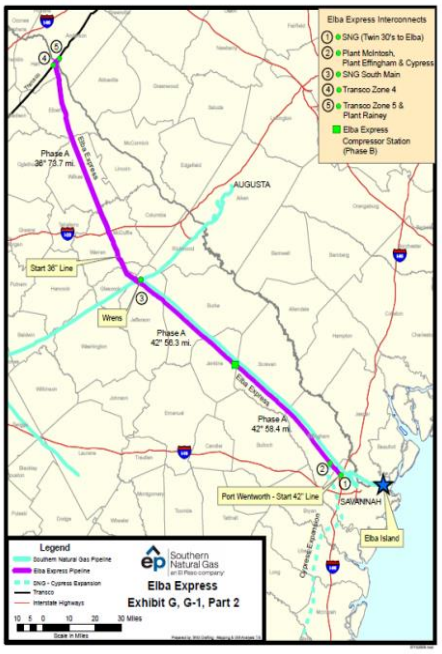
Elba Express pipeline, also part of the Kinder Morgan Sonat System, enters South Carolina in Anderson County, South Carolina as show in Figure 13. This crossing into South Carolina connects to Santee Cooper's Plant Rainey as well as Transco. There is also an interconnect in Georgia at Elba Island with CGT. The Elba Express pipeline was originally constructed to move LNG that was being imported into the Elba Island LNG facility to be redelivered to regional markets, including South Carolina. However, with the growth in domestic shale gas production and the market price of natural gas in the US, imports of LNG into Elba Island and across the US have been declining. As outlined earlier, there are a number of LNG export facilities currently under construction.

Figure 12: Sonat System Map



(Source: Kinder Morgan)

Figure 13: Elba Express Map

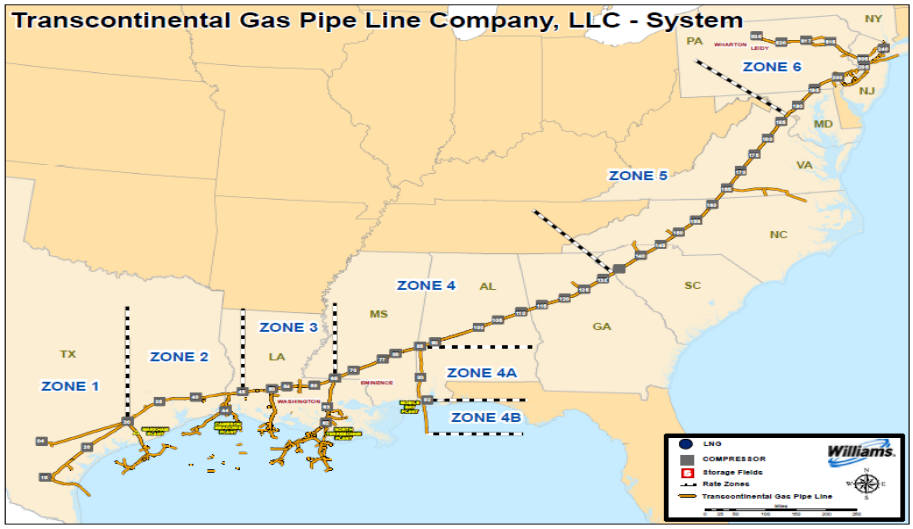


The main Sonat delivery point into South Carolina is on the East of Wrens portion of the pipeline at the approximately 475,000 Mcf/d Aiken interconnect with CGT. Additionally, there are two delivery points off of Sonat with SCE&G. One delivers up to 125,000 Mcf/d to the 650 Megawatt Urquhart power plant and the other delivers up to 80,000 Mcf/d to North Augusta. According to the EIA, Sonat delivered approximately 56 BCF of gas into the State of South Carolina in 2014. This compares to historical flows of 51 BCF in 2013, 66 BCF in 2012, and 63 BCF in 2011.

Transcontinental Pipeline (Transco)

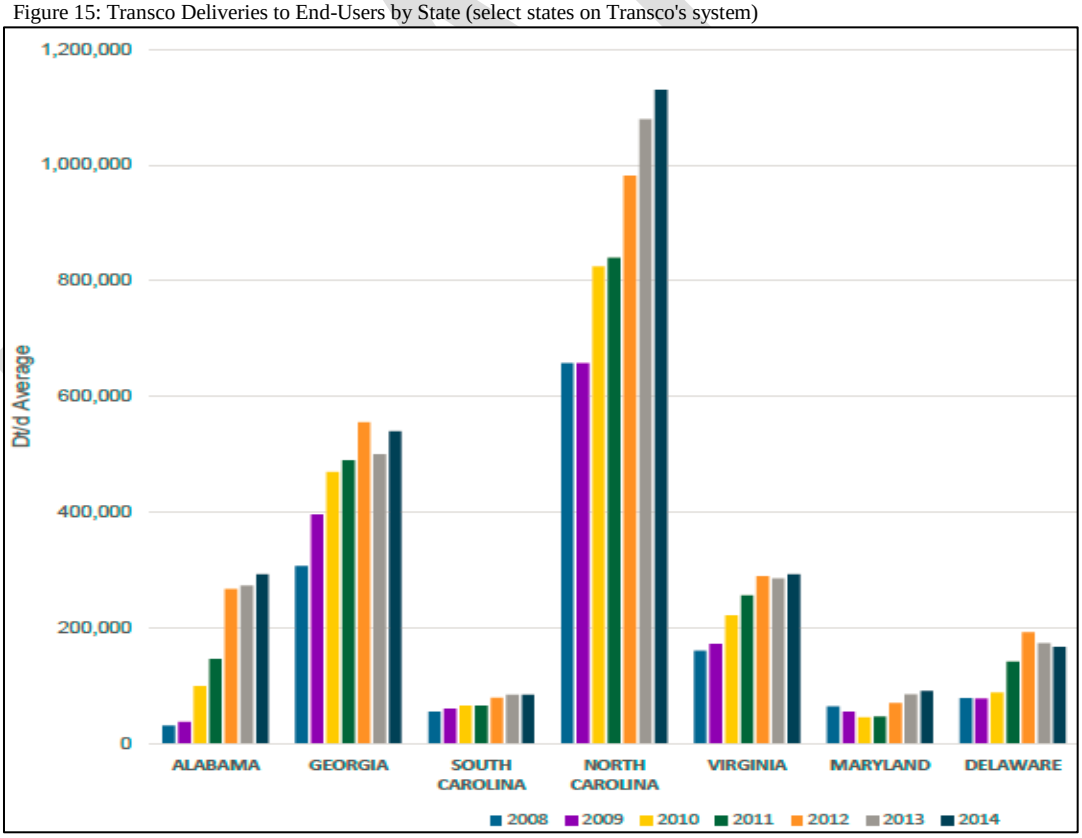
Transco is owned and operated by Williams Companies, Inc. It is one of the largest natural gas pipeline systems in North America. It spans over 10,500 pipeline miles from Texas to New York. There are two compressor stations on Transco in South Carolina: Anderson and Moore. Per Transco, the design capacity of the pipeline into South Carolina is approximately 3.8 Bcf/day.

Figure 14: Transco System Map (Source: Williams)



Transco is the largest interstate pipeline source of gas for the State. According to the EIA, approximately 717 BCF flowed into South Carolina in 2014. This 717 BCF includes consumption in multiple states, from South Carolina to Mid-Atlantic markets. South Carolina's end-user consumption compared to other states is shown in Figure 15. The 717 BCF that flowed into South Carolina is lower than previous years as south-to-north flow displacement continues as a result of Marcellus shale production growth. Historical flows on Transco into South Carolina were approximately 805 BCF in 2013, 977 BCF in 2012, and 1,034 BCF in 2011. Figure 15 also shows South Carolina's end-user consumption growth on Transco.

Figure 15: Transco Deliveries to End-Users by State (select states on Transco's system)



(Source: Williams)

4) Municipal Gas Utilities

There are 14 municipal owned and operated gas utilities in the State. Five are Natural Gas Authorities which are Chester County, Clinton-Newbery, Fort Hill, Lancaster County, and York County. Four are Commission of Public Works which are Bamberg,

Greenwood, Greer and Laurens. Five are City or Town entities which are Bennettsville, Fountain Inn, Orangeburg, Union, and Winnsboro.

In addition, Patriots Energy Group operates a natural gas transmission pipeline that crosses Chester, Lancaster and York counties. It is jointly owned between Chester County NGA, Lancaster County NGA, and York County NGA.

5) Investor Owned Utilities

There are two IOU's in South Carolina: South Carolina Electric &Gas ("SCE&G") and Piedmont Natural Gas ("PNG").

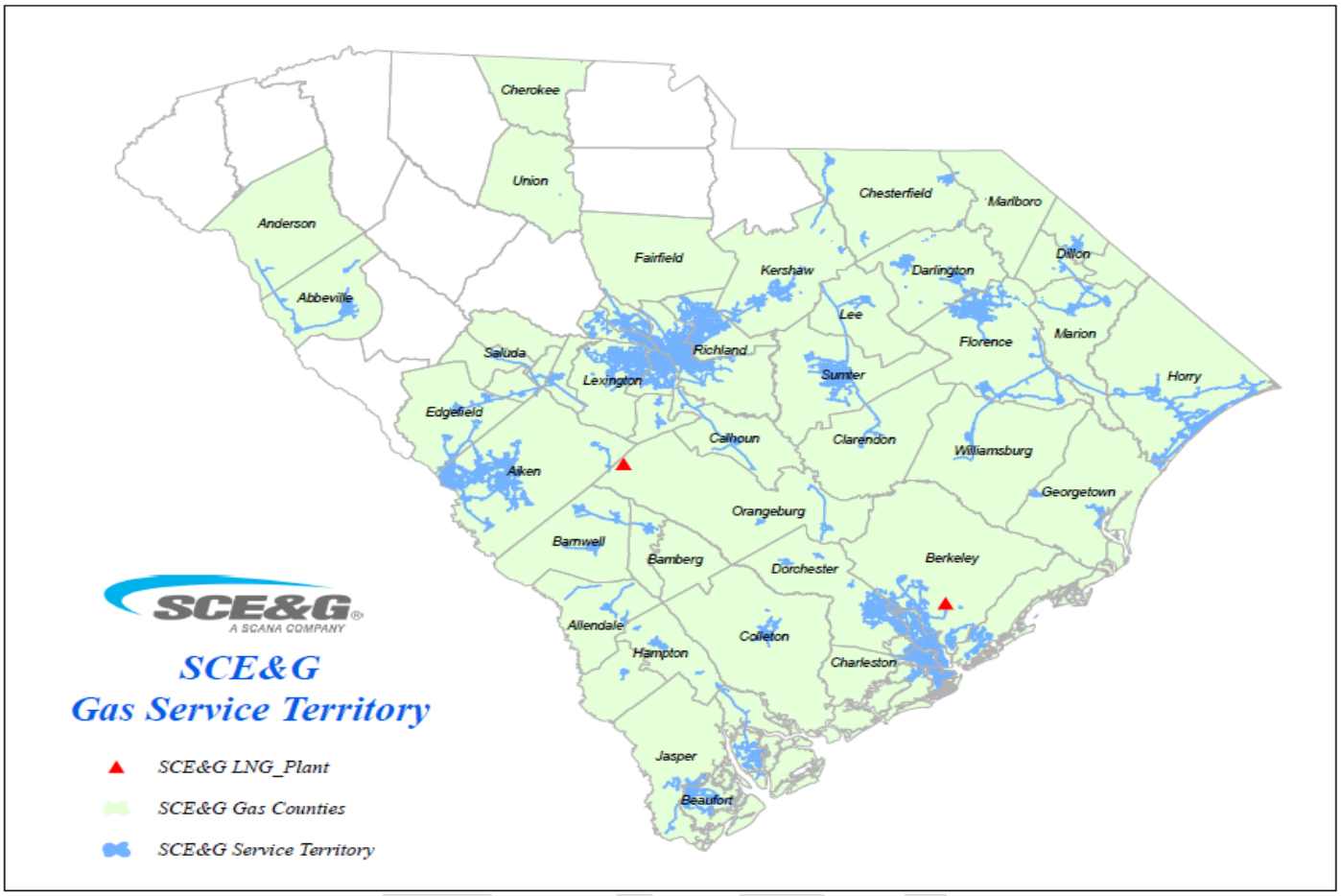
SCE&G

SCE&G purchases its natural gas from multiple gas producers for delivery by Dominion Company, Transco Pipeline and Southern Natural Pipeline into South Carolina. Total volume from all suppliers reached 62 BCF in 2015. SCE&G transports natural gas through approximately 447 miles of high pressure transmission pipelines to the distribution systems in the cities, communities and customers we serve. SCE&G maintains 9064 miles of distribution pipelines to serve roughly 349,000 customers. The net customer growth in 2015 was 2.7%.

The transmission system is made up of steel pipe from 4" to 20" diameter with wall thicknesses from 0.188" to 0.375". Typical maximum allowable operating pressures (MAOP) range from 469 to 1200 psig. The transmission pipeline serves gas to large industry, municipalities, commercial and residential customers and includes 34 miles of High Consequence Areas (HCA). The distribution system is made up of steel and plastic pipe. Steel pipe sizes are ¾" to 12" with wall thickness of 0.188" to 0.250". Typical pressures range from 25 to 250 psig. Plastic pipe sizes are ½" to 8" with standard dimension ratios (SDR) from 7.0 to 13.5 and typical pressures from 25 to 150 psig. The distribution pipeline uses various above ground regulating and valve stations to serve gas to commercial, residential, housing authorities and other master meter accounts.

SCE&G operates two Liquefied Natural Gas (LNG) facilities. Located in Bushy Park, SC and Salley, SC these facilities have the capacity to hold 23 million gallons of LNG, the equivalent of approximately 2 BCF of natural gas. When required these facilities can supply an additional 105 million cubic feet of natural gas per day for delivery into the local distribution systems.

Figure 16: SCE&G gas service territory



(Source: SCE&G)

PNG

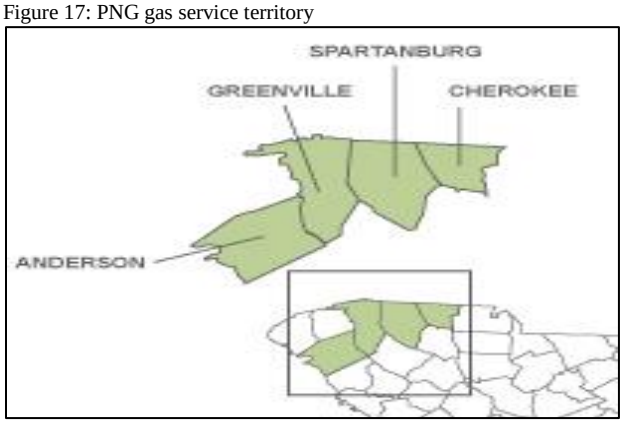
Founded in 1950, Piedmont Natural Gas Company, Inc. (”Piedmont” or “the Company”) provides regulated natural gas transmission and distribution service to over one million residential, commercial, and industrial and power generation customers in North Carolina, South Carolina and Tennessee. The Company’s South Carolina service area includes major portions of Anderson, Greenville, Spartanburg and Cherokee Counties. In South Carolina, Piedmont currently serves approximately 139,000 customers. Due to its close proximity and interconnection with major interstate natural gas transmission pipeline infrastructure, Piedmont’s own natural gas pipeline delivery system in South Carolina has been instrumental in establishing the Upstate as South Carolina’s leading manufacturing and industrial hub. Piedmont delivered approximately 28 BCF of natural gas to its South Carolina customers in 2015, over half of which was for the manufacturing, induction and power generation sector.

Piedmont ensures the delivery of the gas supplies to its distribution system to meet the design peak day, seasonal and annual needs of its firm customers by using a variety of firm transportation and storage capacity contracts from interstate pipelines that are regulated by the Federal Energy Regulatory Commission. Piedmont purchases natural gas supplies for its sales customers by contracting primarily with major and independent producers and marketers. Piedmont’s review and implementation of its gas supply acquisition strategy ensures that Piedmont has adequate and reliable supplies to meet the peak day needs of its utility customers. Piedmont evaluates ongoing cold weather conditions and corresponding customer consumption patterns, as well as historical winter weather, in developing the peak day requirements for its customers.

Piedmont operates and maintains 3,789 miles of transmission and distribution mains at operating pressures between 15 and 800 psi in South Carolina. Coated and catholically protected steel distribution mains account for 1,450 miles of the total with the remaining 2,228 miles being constructed in plastic. Steel pipe diameters range from ¾” to 16” and plastic pipe diameters are ½” to 8”.

Piedmont also owns and operates three publically accessible compressed natural gas ("CNG") fueling stations in South Carolina. These stations, which are located in Greenville, Spartanburg and Anderson, provide CNG to fuel our own Company vehicle fleet and to meet the growing demand for CNG from public and private vehicle fleet operators and the general public.

Figure 17: PNG gas service territory



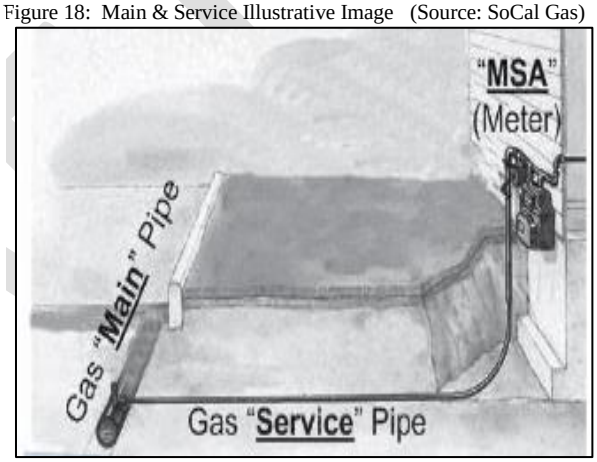
(Source: Piedmont)

6) Gas Utility Infrastructure

The infrastructure of a gas utility is comprised of two main components: mains and services. Figure 18 illustrates how a gas main comes from an interstate pipeline to the gas service, which then connects to the end-user's meter. Mains and services come in various sizes and materials.

All reported infrastructure in South Carolina is made of steel or plastic (polyethylene). While steel is used for all pipe sizes, it currently is primarily used for larger pipes. Over the last twenty years, polyethylene pipe use has increased due to its longer lifespan as in general plastic has a longer lifespan than steel due to steel's natural corrosion from elements in the ground and moisture. South Carolina Gas Utilities report that there is no iron or copper gas infrastructure in South Carolina. Additionally, no natural gas utilities in the State of South Carolina have reported any mains or services built prior to 1950. The largest portion of gas utility infrastructure construction occurred between 1990 and 2009.

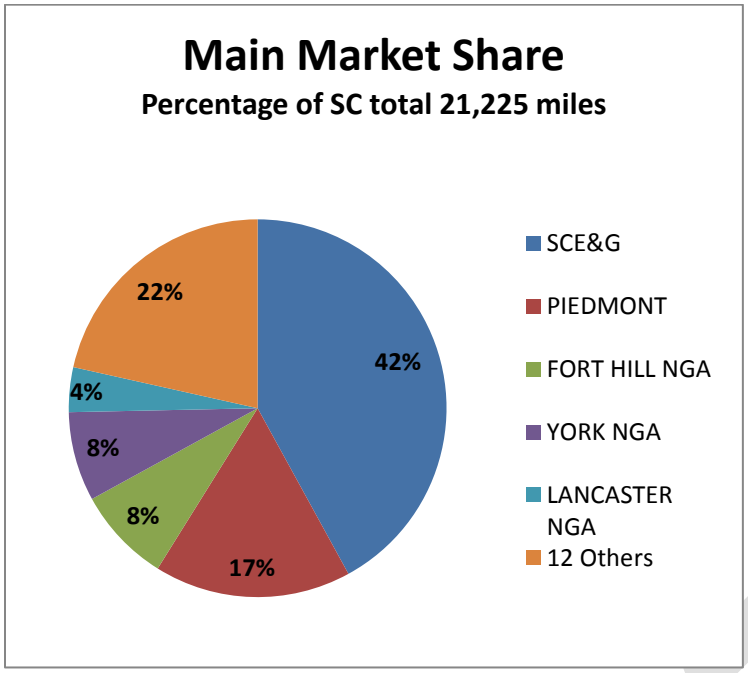
Figure 18: Main & Service Illustrative Image (Source: SoCal Gas)



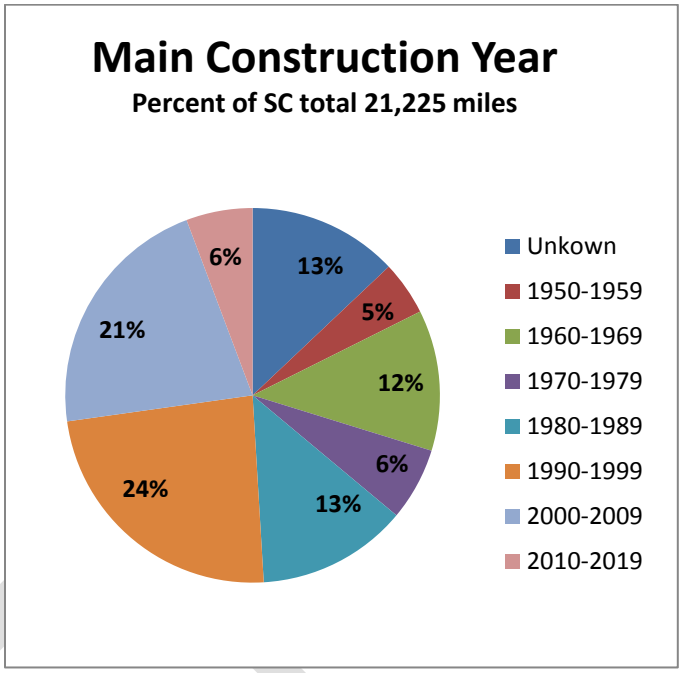
The gas main pipeline infrastructure of the State transports natural gas from the interstate pipelines to the service lines. As of 2014, the State had approximately 21,225 miles of gas main pipeline between its IOU and municipal utilities. Figures 19 through 22 detail the market share, size, material composition, and age of South Carolina's gas main infrastructure.

Figure 19: South Carolina Gas Utility - Main Market Share

Figure 20: South Carolina Gas Utility - Construction Year of Mains



(Source: PHMSA)



(Source: PHMSA)

Figure 21: South Carolina Gas Utility - Mains by Size

SC GAS UTILITY	2" or Less	>2"-4"	>4"-8"	>8"-12"	>12"	Total
SOUTH CAROLINA ELECTRIC & GAS CO	6,178	1,516	1,140	77	7	**8,918**
PIEDMONT NATURAL GAS CO INC	2,412	669	442	54	-	**3,577**
FORT HILL NGA	1,093	460	144	33	-	**1,730**
YORK COUNTY NGA	1,099	369	152	2	-	**1,622**
LANCASTER COUNTY NGA	570	170	73	-	-	**813**
GREENWOOD CPW	407	246	46	43	-	**742**
CLINTON - NEWBERRY NGA	477	191	64	-	-	**732**
GREER CPW	449	220	60	-	-	**729**
CHESTER COUNTY NGA	385	170	35	-	-	**590**
UNION, CITY OF	235	109	57	5	-	**405**
LAURENS CPW	227	78	42	44	-	**391**
ORANGEBURG PUBLIC UTILITIES	210	59	52	30	-	**351**
FOUNTAIN INN NGA	176	108	19	-	-	**303**
WINNSBORO, TOWN OF	68	50	21	-	-	**138**
BENNETTSVILLE, CITY OF	56	28	2	-	-	**86**
BAMBERG BOARD OF PUBLIC WORKS	51	32	-	-	-	**83**
PATRIOTS ENERGY GROUP	-	3	13	-	-	**16**
	14,092	**4,478**	**2,361**	**286**	**7**	**21,225**
	66%	21%	11%	1%	0%	

(Source: PHMSA)

Figure 22: South Carolina Gas Utility - Mains by Material

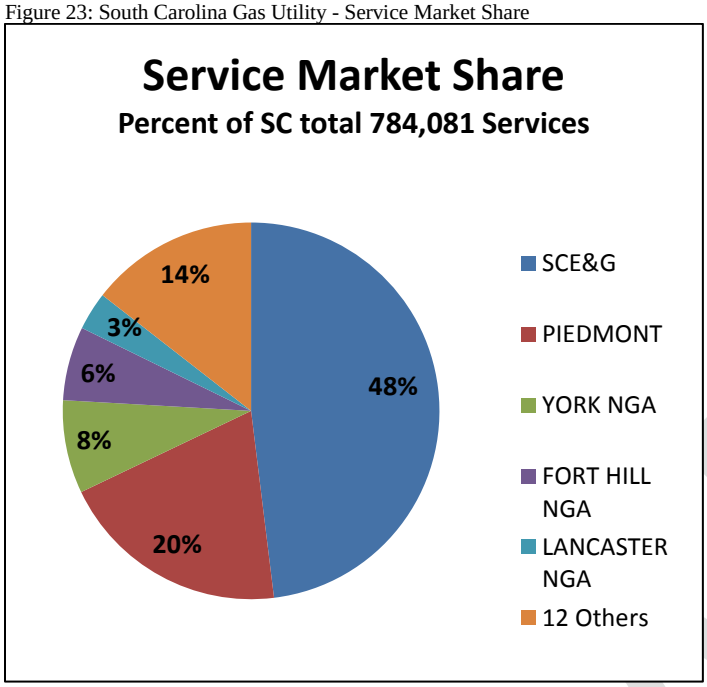
SC GAS UTILITY	Steel	Plastic	Total	% Steel	% Plastic
SOUTH CAROLINA ELECTRIC & GAS CO	3,905	5,013	8,918	44%	56%
PIEDMONT NATURAL GAS CO INC	1,461	2,116	3,577	41%	59%
FORT HILL NGA	742	988	1,730	43%	57%
YORK COUNTY NGA	358	1,264	1,622	22%	78%
LANCASTER COUNTY NGA	234	579	813	29%	71%
GREENWOOD CPW	332	410	742	45%	55%
CLINTON - NEWBERRY NGA	188	544	732	26%	74%
GREER CPW	182	547	729	25%	75%
CHESTER COUNTY NGA	123	467	590	21%	79%
UNION, CITY OF	172	233	405	43%	57%
LAURENS CPW	169	222	391	43%	57%
ORANGEBURG PUBLIC UTILITIES	236	115	351	67%	33%
FOUNTAIN INN NGA	70	233	303	23%	77%
WINNSBORO, TOWN OF	70	68	138	51%	49%
BENNETTSVILLE, CITY OF	54	32	86	63%	37%
BAMBERG BOARD OF PUBLIC WORKS	38	45	83	46%	54%
PATRIOTS ENERGY GROUP	16	-	16	100%	0%
	8,350	**12,875**	**21,225**	**39%**	**61%**

(Source: PHMSA)

Service Infrastructure

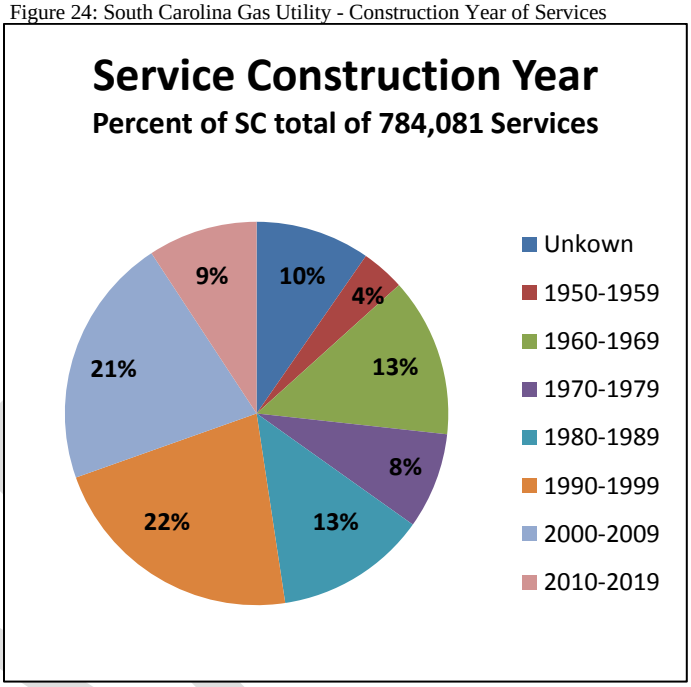
The gas service pipeline infrastructure of the State is transports the natural gas from the main pipes to the end-user's meter. As of 2014, the State of South Carolina had approximately 784,092 service lines between the IOU's and Municipal Utilities. Figures 23 through 26 detail the market share, size, material composition, and age of South Carolina's gas line infrastructure.

Figure 23: South Carolina Gas Utility - Service Market Share



(Source: PHMSA)

Figure 24: South Carolina Gas Utility - Construction Year of Services



(Source: PHMSA)

Figure 25: South Carolina Gas Utility - Services by Size

SC GAS UTILITY	Unkown	1" or Less	>1"-2"	>2"-4"	>4"-8"	>8"	Total
SOUTH CAROLINA ELECTRIC & GAS CO	3	355,896	20,727	129	30	1	**376,786**
PIEDMONT NATURAL GAS CO INC	-	144,274	11,102	223	26	11	**155,636**
YORK COUNTY NGA	-	62,549	165	18	2	-	**62,734**
FORT HILL NGA	-	49,144	598	20	3	-	**49,765**
LANCASTER COUNTY NGA	-	25,631	55	9	1	-	**25,696**
GREENWOOD CPW	-	24,008	181	26	2	-	**24,217**
GREER CPW	-	21,393	565	77	3	-	**22,038**
CLINTON - NEWBERRY NGA	-	16,110	213	28	-	-	**16,351**
ORANGEBURG PUBLIC UTILITIES	-	10,088	72	5	3	-	**10,168**
CHESTER COUNTY NGA	-	9,979	47	12	4	-	**10,042**
LAURENS CPW	7,414	348	11	1	-	-	**7,774**
FOUNTAIN INN NGA	-	7,643	48	4	-	-	**7,695**
UNION, CITY OF	-	7,355	26	15	-	-	**7,396**
BENNETTSVILLE, CITY OF	-	3,292	-	-	-	-	**3,292**
WINNSBORO, TOWN OF	-	2,863	19	-	1	-	**2,883**
BAMBERG BOARD OF PUBLIC WORKS	-	1,595	12	1	-	-	**1,608**
PATRIOTS ENERGY GROUP	-	-	-	-	-	-	-
	7,417	**742,168**	**33,841**	**568**	**75**	**12**	**784,081**
	1%	95%	4%	0%	0%	0%	

(Source: PHMSA)

Figure 26: South Carolina Gas Utility - Services by Material

SC GAS UTILITY	Steel	Plastic	Total	% Steel	% Plastic
SOUTH CAROLINA ELECTRIC & GAS CO	93,173	283,613	376,786	25%	75%
PIEDMONT NATURAL GAS CO INC	25,288	130,348	155,636	16%	84%
YORK COUNTY NGA	5,232	57,502	62,734	8%	92%
FORT HILL NGA	18,062	31,703	49,765	36%	64%
LANCASTER COUNTY NGA	2,089	23,607	25,696	8%	92%
GREENWOOD CPW	8,160	16,057	24,217	34%	66%
GREER CPW	3,629	18,409	22,038	16%	84%
CLINTON - NEWBERRY NGA	2,501	13,850	16,351	15%	85%
ORANGEBURG PUBLIC UTILITIES	6,167	4,001	10,168	61%	39%
CHESTER COUNTY NGA	2,016	8,026	10,042	20%	80%
LAURENS CPW	2,396	5,378	7,774	31%	69%
FOUNTAIN INN NGA	727	6,968	7,695	9%	91%
UNION, CITY OF	3,885	3,511	7,396	53%	47%
BENNETTSVILLE, CITY OF	2,255	1,037	3,292	68%	32%
WINNSBORO, TOWN OF	852	2,031	2,883	30%	70%
BAMBERG BOARD OF PUBLIC WORKS	732	876	1,608	46%	54%
PATRIOTS ENERGY GROUP	-	-	-	-	-
	177,164	**606,917**	**784,081**	**23%**	**77%**

(Source: PHMSA)